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(54) Sprocket assembly for a bicycle

Zusammenbau eines mehrstufigen Kettenrades für ein Fahrrad

Ensemble de jeu de pignons à chaîne pour bicyclette

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention is directed to multiple sprocket assemblies for bicycles.

[0002] In recent years, as the number of speeds available in bicycle transmissions has increased, the number of sprocket wheels installed on the rear-wheel sprocket assembly of such bicycles has increased to 5 or 7 sprocket wheels or more. As a result, there has been a demand for simplification of the attachment structure and facilitation of the attachment method used in such cases. For example, in the rear-wheel multiple sprocket assembly described in Japanese Utility Model Application Kokai No. 63-4893, the demand is satisfied by a structure in which a plurality of sprocket wheels formed as annular plates are fit over the outer circumferential surface of a cylindrical boss member with spacers interposed between each sprocket wheel. The mutual connection of the respective sprocket wheels and spacers is accomplished by means of screws, etc, and splines are formed between the sprocket wheels and the boss member in order to prevent relative rotation between the components.

[0003] In order to reduce the weight of any multiple sprocket assembly, it is desirable to reduce the volume of the sprocket wheels. However, in the above structure the distance from the teeth of the sprocket wheel with the largest external diameter to the boss engaging portion of the sprocket wheel is fairly large, so the sprocket wheel must have a sufficient thickness in order to avoid deformation when torque is transmitted. Thus, since the sprockets in the above type of assembly must be made thicker to avoid deformation when torque is transmitted, an increase in weight is unavoidable.

[0004] In order to solve the problems encountered in the these conventional sprocket wheel units, an improved multiple sprocket assembly is disclosed in JP 4-297390. This multiple sprocket assembly comprises a spider (sprocket support) which supports a plurality of ring-shaped sprocket wheels. A light metal such as aluminum, etc., is generally used for the spider, while various types of steel materials are used for the sprocket wheels to provide adequate strength. The spider comprises [I] a boss part and [ii] a plurality of supporting arms which extend radially outward from the outer circumferential surfaces of the boss part in directions perpendicular to the axis of the boss part. The sprocket wheels are attached to mounting surfaces formed as steps in the radial direction on one side surface of each of the supporting arms. In this construction, the ring shapes of the respective sprocket wheels are set so that the sprocket wheels have a short radial width just sufficient to allow the formation of teeth and attachment holes. Accordingly, this construction is greatly improved in terms of weight reduction. However, a drawback of a multiple sprocket assembly unit constructed in this manner is that in cases where there is little difference in the respective numbers of teeth of adjacent sprocket wheels (so that there is no great difference in the diameters of the adjacent sprocket wheels), the attachment parts of one sprocket wheel overlap with the attachment parts of the other sprocket wheel in the radial direction. As a result, the radial widths of the two sprocket wheels must be increased in order to attach both sprocket wheels to the same supporting arms, so that the merit of weight reduction again is lost.

SUMMARY OF THE INVENTION

[0005] The present invention is directed to a lightweight multiple sprocket assembly for a bicycle which allows the use of a spider-type sprocket support with sprockets having small differences in the number of teeth between adjacent sprockets. In one embodiment of the present invention, a multiple sprocket assembly includes one or more sprocket subassemblies. Each sprocket subassembly includes a spider-type sprocket - support which supports first and second sprockets. The sprocket support includes a boss and a plurality of supporting arms extending radially outward from the boss. Each supporting arm includes a first mounting surface and a second mounting surface opposite the first mounting surface in an end region of the supporting arm. The boss includes a first engaging means disposed on an inner peripheral surface thereof for engaging with a one-way clutch mechanism.

[0006] The first sprocket is mounted to the first mounting surface of each supporting arm, and the second sprocket is mounted to the second mounting surface of each supporting arm. A difference between a number of teeth on the first sprocket and a number of teeth on the second sprocket is small, e.g., from one to three teeth. In a more specific embodiment, a fastening means in the form of an attachment pin which extends through a first sprocket opening in the first sprocket, a second sprocket opening in the second sprocket, and an attachment opening in a corresponding supporting arm fastens the first sprocket and the second sprocket to the respective first mounting surface and second mounting surface.

[0007] One or more third sprockets may be disposed in a row with the first sprocket and the second sprocket, wherein each third sprocket has a second engaging means disposed on an inner peripheral surface thereof for engaging with the one-way clutch mechanism. If desired, a spacer may be disposed between adjacent third sprockets to set the appropriate distance between the sprockets. To set the appropriate distance between the second sprocket and the third sprocket immediately adjacent to it, the boss of the sprocket support, which is concentric with an axis (X), may include front and rear portions which extend in the direction of the axis (X). The front and rear portions also may be used to set the appropriate distance between the second sprocket of

one sprocket subassembly and the first sprocket of an adjacent sprocket subassembly by aligning the front and rear portions of one sprocket subassembly with the front and rear portions of the adjacent sprocket subassembly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Figure 1 is a cross-sectional view of a particular embodiment of a multiple sprocket assembly according to the present invention;
Figure 2 is a cross sectional view of one of the sprocket subassemblies shown in Figure 1;
Figure 3 is a front view of the sprocket subassembly shown in Figure 2;
Figure 4 is a front view of a particular embodiment of a sprocket support according to the present invention;
Figure 5 is a perspective view of the sprocket support shown in Figure 4;
Figure 6 is a top view illustrating shifting of a chain from one sprocket to another;
Figure 7 is a side view illustrating shifting of a chain from one sprocket to another;
Figure 8 is a front view of a ring-shaped sprocket shown in Figure 4; and
Figure 9 is a front view of a spacer shown in Figure 4.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0009] Figure 1 shows a rear wheel hub assembly in the form of a free hub 90 which is fastened to a bicycle frame 80 through a quick-release mechanism 91. A one-way clutch mechanism 92 consisting of an outer race 92a, an inner race 92b and one-way pawls 92c is installed on one end of free hub 90. Engaging grooves or splines 92d which extend along the axis X of the rear axle are formed on the outer circumferential surface of the outer race 92a. A 7-speed multiple sprocket assembly 100 is mounted on the outer race 92a so that the multiple sprocket assembly 100 is fit into the engaging grooves 92d, and the movement of multiple sprocket assembly 100 in the axial direction is checked by means of a ring stopper 93. In order to prevent relative rotation between the multiple sprocket assembly 100 and the outer race 92a, engaging means 101 are formed on the inner circumferential surface of multiple sprocket assembly 100 so that the engaging means 101 face the engaging grooves 92d. These engaging means 101 will be described later. The multiple sprocket assembly 100 shown in Figure 1 is constructed from two sprocket subassemblies, i.e., a first sprocket subassembly 1 and a second sprocket subassembly 2, three ring-shaped sprockets 3a, 3b and 3c which have different numbers of teeth, ring-shaped spacers 4 which are installed between the sprockets 3a,3b,3c, and connecting screws 5 which are passed through the components in order to form an integral unit.

[0010] As is shown in Figures 2 and 3, the first sprocket subassembly 1 consists of a spider-type sprocket support 10 and first and second sprockets 20 and 30. Spider 10 is equipped with a boss part 11 which has an axis X, and six supporting arms 15 which extend radially outward from the outer circumferential surface of the boss part 11 in directions substantially perpendicular to the axis X. The first sprocket 20 and second sprocket 30 are attached to the spider 10. In this embodiment, the first sprocket 20 has 21 teeth, and the second sprocket 30 has 19 teeth, so that the difference in the number of teeth between the two sprocket wheels is 2 teeth. As a result, the external diameters of the two sprocket wheels are not very different.

[0011] First mounting surfaces 16 are formed in a radial direction (i.e., in directions substantially perpendicular to the axis X) on the tip regions of the respective supporting arms 15 for mounting the first sprocket 20, and second mounting surfaces 17 are formed in a radial direction (i.e., in directions substantially perpendicular to the axis X) on the tip regions of the respective supporting arms 15 for mounting the second sprocket 30. These first mounting surfaces 16 and second mounting surfaces 17 are formed opposite each other on the front and back surfaces of the supporting arms 15.

[0012] Attachment holes 18 which pass through the supporting arms 15 from the first mounting surfaces 16 to the second mounting surfaces 17 are formed parallel to the axis X. As shown in Figure 3, tongue parts 35 which project toward the axis X are formed on the inner circumferential surface of the second sprocket 30 to minimize the radial width of the sprocket and thereby save weight, and through-holes 31 are formed through these tongue parts 35. Similarly, tongue parts 25 which project toward the axis X are also formed on the inner circumferential surface of the first sprocket 20, and through-holes 21 are formed in these tongue parts 21. Both sprockets are fastened to the mounting surfaces of the supporting arms 15 in a prescribed positional relationship by means of rivet pins 6 which are passed through the through-holes 21 and 31 and the attachment holes 18 of the supporting arms 15. This prescribed positional relationship of the two sprocket wheels will be described with reference to Figures 3, 6 and 7.

[0013] As shown in Figure 3, the relative positions of the respective tooth parts 22 and 32 of the first sprocket 20 and second sprocket 30, i.e., the phases of tooth parts in terms of rotation about the axis X, are shifted by a prescribed amount so that the chain roller 71 (Figures 6 and 7) which begins to engage with the first sprocket 20 in the chain section 7 that is shifted from the second sprocket 30 to the first sprocket 20 during a speed change is positioned in a central region, i.e., the tooth valley part 23, located between the tooth part 22a and

tooth part 22b of the first sprocket 20. The chain roller 72 which begins to leave the second sprocket wheel 30 is positioned in a central region located between the tooth parts 32a and 32b of the second sprocket 30, i.e., in the tooth valley part 33. In other words, the distance along the shifting chain 7 from the central region between the tooth part 32a and tooth part 32b of the second sprocket 30 to the central region between the tooth part 22a and tooth part 22b of the first sprocket 20 is substantially an integral multiple of the chain pitch. As a result, the shifting of the chain 7 during a speed change is smooth. If desired, the shape of tooth 22a or teeth adjacent to tooth 22a may be shaped (e.g., by tilting in the direction of chain travel, narrowing, thinning, shortening, chamfering, etc.) to further enhance the chain shifting operation.

[0014] Furthermore, a recess 24 which receives at least some of the chain plates of the shifting chain section 7 is formed in the side surface of the first sprocket 20 facing the second sprocket 30. As a result, the shifting chain section 7 can approach the first sprocket 20 more closely, so that the engagement between the shifting chain section 7 and the first sprocket 20 becomes even smoother. This recess 24 extends to the tooth part 22b located forward (with respect to the direction of rotation of the sprockets indicated by the arrow) of the tooth part 22a where the shifting chain section 7 begins to engage, and extends further to the side wall of the tooth part 22c located even further forward, and to a point beneath the side wall, so that at least some of the chain plates of the shifting chain section 7 can be received. In Figure 6, outer plates of the chain section 7 are positioned at the tooth part 22a. Consequently, the tooth part 22a enters the space between these outer plates. In cases where inner plates of the chain section 7 are positioned at the tooth part 22a, the positional relationship is such that the tooth part 22a contacts the outer surface of one of the inner plates. With both of these positional relationships being included, the tooth part 22a is viewed as the tooth part where the shifting chain section 7 begins to engage, and the tooth valley part 23 located between this tooth part 22a and the tooth part 22b is used as a reference for the phase relationship of the first sprocket 20 and second sprocket 30.

[0015] While only the first sprocket subassembly 1 has been described, the second sprocket subassembly 2 is also assembled in a similar positional relationship. Moreover, this relationship is maintained between the first sprocket subassembly 1 and second sprocket subassembly 2, and between all of the sprockets including the sprockets 3a, 3b and 3c. Accordingly, not only is a recess 34 also formed in the second sprocket 30, but recesses are formed in all of the sprockets except for the sprocket with the smallest diameter. However, a system in which a recess is also formed in the sprocket with the smallest diameter so that all of the parts are of a common type could also be used.

[0016] As shown in Figure 4, engaging grooves 101a which extend in the axial direction are formed in the inner circumferential surface of the boss part 11 of the spider 10. Furthermore, holes 19 through which the connecting screws 5 are passed are formed in the boundary region between the supporting arms 5 and the boss part, in a plurality of positions which are equally spaced in the circumferential direction.

[0017] The boss part 11 has a front end surface 12 and a rear end surface 13 which extend in a radial direction with respect to the axis X. As shown in Figure 1, the distance between end surfaces 12 and 13, i.e., the length of the boss part 10 in the direction of the axis X, is set so that the final assembly spacing in the direction of the axis X of the adjacent sprockets mounted on the respective sprocket subassemblies is obtained by causing the rear end surface 13 of the first sprocket subassembly 1 to contact the front end surface 12 of the second sprocket subassembly 2.

[0018] The preceding description has been a description of the first sprocket subassembly 1, but the second sprocket subassembly 2 has a similar configuration. Sprocket subassembly 2 differs from the first sprocket subassembly 1 in that the respective numbers of teeth of the mounted sprocket wheels are 17 teeth and 16 teeth, and in that the lengths of the arm parts of the spider are correspondingly shorter. Otherwise, this second sprocket subassembly 2 is substantially the same as the first sprocket subassembly 1. Engaging grooves 101a which extend in the axial direction are formed in the inner circumferential surface of the boss part, and holes through which the connecting screws 5 are passed are also formed. Accordingly, further description of the second sprocket subassembly 2 will be omitted.

[0019] Figure 8 shows the first, second and third annular plate-shaped sprocket wheels 3a, 3b and 3c. In this embodiment, the respective numbers of teeth of these sprocket wheels are 15 teeth, 14 teeth and 13 teeth. Engaging grooves 101b which extend in the axial direction are formed on the inner circumferential surfaces of the sprockets, and holes through which the connecting screws 5 are passed are similarly formed near the inner circumferential surfaces.

[0020] Figure 9 illustrates one of the ring-shaped spacers 4. Engaging grooves 101c which extend in the axial direction are formed in the inner circumferential surface of this ring-shaped spacer 4, and recesses through which the connecting screws 5 are passed are formed in the outer circumferential surface of the spacer. The thickness of each ring-shaped spacer 4 is set so that the final assembly spacing of the adjacent sprocket wheels in the direction of the axis X is obtained.

[0021] As is shown in Figure 1, when the first sprocket subassembly 1, the second sprocket subassembly 2, the first, second and third sprockets 3a, 3b and 3c and spacers 4 are formed into an integral unit by means of the connecting screws 5, the engaging grooves 101a, 101b and 101c formed in the inner circumferential sur-

faces of the respective components constitute an overall set of engaging grooves, i.e., an engaging means 101, which engages with the engaging recesses 92d formed in the free hub 90.

[0022] While the above is a description of various embodiments of the present invention, further modifications may be employed without departing from the spirit and scope of the present invention. For example, in regard to the respective numbers of teeth of the sprockets mounted in the sprocket subassemblies, various combinations of numbers of teeth (differing by only a few teeth) other than the combination of 21 teeth and 19 teeth, or the combination of 18 teeth and 17 teeth, may be used. Combinations of sprocket subassemblies and individual sprockets may be arbitrarily selected, or the multiple sprocket assembly may be constructed using only sprocket subassemblies. It would also be possible to form the outer race of the one-way clutch mechanism 92 itself on the inner circumferential surfaces of the wheels instead of the engaging means 101. Although steel was used as the material of the sprockets and an aluminum alloy was used as the material of the spider, it would also be possible to use special alloys, sintered alloys or artificial materials instead. Fastening rivets 6 may be replaced by bolts and nuts, projections which extend from the supporting arms 15, etc..

[0023] Thus, the scope of the invention should not be limited by the specific structures disclosed. Instead, the true scope of the invention should be determined by the following claims. Of course, although labeling symbols are used in the claims in order to facilitate reference to the figures, the present invention is not intended to be limited to the constructions in the appended figures by such labeling.

Claims

1. A rear wheel sprocket subassembly for a bicycle comprising:

   a sprocket support (10) including:
   a boss (11) including a first engaging means (101a) disposed on an inner peripheral surface thereof for engaging with a one-way clutch mechanism (92); and
   a plurality of supporting arms (15) extending radially outward from the boss (11);
   wherein each supporting arm (15) includes a first mounting surface (16) and a second mounting surface (17) opposite the first mounting surface (16) in an end region of the supporting arm (15);
   a first sprocket (20) mounted to the first mounting surface (16) of each supporting arm; and
   a second sprocket (30) mounted to the second mounting surface (17) of each supporting arm;
   wherein:
   said first sprocket includes a first plurality of teeth and said second sprocket includes a second plurality of teeth different in number from said first plurality of teeth, the difference between the number of teeth on the first sprocket (20) and the number of teeth on the second sprocket (30) being in the range from one to three teeth.

2. The rear wheel sprocket subassembly according to claim 1 wherein the first sprocket (20) and second sprocket (30) are fastened to the respective first mounting surface (16) and second mounting surface (17) so that a chain roller (71) that begins to engage with the first sprocket (20) when a chain (7) shifts from the second sprocket (30) to the first sprocket (20) is positioned in a central region (23) between adjacent teeth (22a, 22b) of the first sprocket (20).

3. The rear wheel sprocket subassembly according to either preceding claim wherein a recess (24) is formed on a side surface of the first sprocket (20) facing the second sprocket (30) for receiving at least a portion of chain plates of a chain section that shifts from the second sprocket (30) to the first sprocket (20).

4. The rear wheel sprocket subassembly according to any preceding claim wherein a recess (34) is formed on a side surface of the second sprocket (30) facing away from the first sprocket (20) adapted to receive at least a portion of chain plates of a chain section that shifts from a third sprocket to the second sprocket (30), wherein the third sprocket has fewer teeth than the second sprocket.

5. The rear wheel sprocket subassembly according to any preceding claim further comprising fastening means (6) for fastening the first sprocket (20) and the second sprocket (30) to the respective first mounting surface (16) and second mounting surface (17).

6. The rear wheel sprocket subassembly according to claim 5 wherein the fastening means (6) comprises an attachment pin which extends through a first sprocket opening (21) in the first sprocket (20), a second sprocket opening (31) in the second sprocket (30), and an attachment opening (18) in a corresponding supporting arm (15).

7. The rear wheel sprocket subassembly according to any preceding claim wherein the sprocket support (10) is formed from a material having a specific gravity less than the first sprocket (20) and the second sprocket (30).

8. The rear wheel sprocket subassembly according to

claim 7 wherein the sprocket support (10) is formed from an aluminium alloy, and wherein the first sprocket (20) and the second sprocket (30) are formed from steel.

9. The rear wheel sprocket subassembly according to any preceding claim wherein the boss (11) is concentric with an axis (X), and wherein the boss (11) includes:

a front portion which extends away from the plurality of supporting arms (15) in the direction of the axis (X) and terminates with a front end surface (12); and
a rear portion which extends away from the plurality of supporting arms (15) in the direction of the axis (X) opposite the front portion and terminates with a rear end surface (13).

10. A rear wheel multiple sprocket assembly including a first rear wheel sprocket subassembly (1) according to any preceding claim.

11. A rear wheel multiple sprocket assembly according to claim 10 further comprising one or more third sprockets (3a, 3b, 3c) disposed in a row with the first sprocket (20) and the second sprocket (30).

12. A rear wheel multiple sprocket assembly according to claim 11, each third sprocket (3a, 3b, 3c) having a second engaging means (101b) disposed on an inner peripheral surface thereof for engaging with said one-way clutch mechanism (92).

13. The rear wheel multiple sprocket assembly according to either of claims 11 or 12 wherein each third sprocket (3a, 3b, 3c) has an annular plate shape.

14. The rear wheel multiple sprocket assembly according to any of claims 11 to 13 further comprising a spacer (4) disposed between adjacent third sprockets (3a, 3b, 3c).

15. The rear wheel multiple sprocket assembly according to any of claims 11 to 14 further comprising a connecting means, preferably in the form of a connecting screw, for fastening the first sprocket (20), the second sprocket (30) and at least one third sprocket (3a, 3b, 3c).

16. The rear wheel multiple sprocket assembly according to claim 12 or any claim dependent thereon wherein at least one of the first engaging means (101a) and the second engaging means (101b) comprises a plurality of splines.

17. A rear wheel multiple sprocket assembly according to any of claims 10 to 16 further comprising at least one additional rear wheel sprocket subassembly including a second rear wheel sprocket subassembly (2) in accordance with any of claims 1 to 9.

18. A rear wheel multiple sprocket assembly according to claim 17 wherein the first and second rear wheel sprocket subassemblies (1,2) are disposed in a row.

19. The rear wheel multiple sprocket assembly according to claim 17 or claim 18 wherein the first and second rear wheel sprocket subassemblies (1,2) are both in accordance with claim 9 and wherein the rear portion of the boss (11) of the first rear wheel sprocket subassembly (1) is aligned with the front portion of the boss (11) of the second rear wheel sprocket subassembly (2) for determining the spacing between the second sprocket (30) of the first rear wheel sprocket subassembly (1) and the first sprocket (20) of the second rear wheel sprocket subassembly (2).

20. The rear wheel multiple sprocket assembly according to any of claims 17 to 19, when dependent upon claim 11 or any claim dependent thereon, further comprising connecting means (5) for fastening the first rear wheel sprocket subassembly (1), the second rear wheel sprocket subassembly (2) and each third sprocket (3a, 3b, 3c) together.

21. The rear wheel multiple sprocket assembly according to claim 20 wherein the connecting means (5) comprises a connecting screw which passes through the first rear wheel sprocket subassembly (1), the second rear wheel sprocket subassembly (2) and each third sprocket (3a, 3b, 3c) in the direction of the axis (X).

Patentansprüche

1. Eine Teilmontage eines hinteren Kettenzahnrads eines Fahrrads bestehend aus:

einem Kettenradträger (10) bestehend aus:

einem Vorsprung (11) bestehend aus eine ersten Eingriffsmittel (101a), das an einer inneren Umfangsfläche davon angebracht ist, um in einen Einweg-Kupplungsmechanismus (92) einzugreifen; und

einer Vielzahl von Querträgern (15), die sich von dem Vorsprung (11) radial nach außen erstrecken;
wobei jeder Querträger (15) eine erste Befestigungsfläche (16) und eine zweite Befestigungsfläche (17) gegenüber der ersten Befestigungsfläche (16) in einem Endbereich

des Querträgers (15) beinhaltet;

ein erstes Kettenrad (20) an der ersten Befestigungsfläche (16) des jeweiligen Querträgers befestigt wird; und

ein zweites Kettenrad (30) an der zweiten Befestigungsfläche (17) des jeweiligen Querträgers befestigt wird; wobei:

das erste Kettenrad eine erste Vielzahl von Zähnen beinhaltet und das zweite Kettenrad eine zweite Vielzahl von Zähnen beinhaltet, deren Zahl unterschiedlich von der der ersten Vielzahl von Zähnen ist, wobei der Unterschied zwischen der Zahl von Zähnen auf dem ersten Kettenrad (20) und der Zahl von Zähnen auf dem zweiten Kettenrad (30) in einem Bereich von einem Zahn bis zu drei Zähnen liegt.

2. Teilmontage eines hinteren Kettenzahnrads gemäß Anspruch 1, wobei das erste Kettenrad (20) und das zweite Kettenrad (30) an der jeweiligen ersten Befestigungsfläche (16) und der jeweiligen zweiten Befestigungsfläche (17) befestigt werden, so daß eine Rollenkette (71), die beginnt, in das erste Kettenrad (20) einzugreifen, wenn eine Kette (7) von dem zweiten Kettenrad (30) zu dem ersten Kettenrad (20) verschoben wird, sich in einem mittigen Bereich (23) zwischen den angrenzenden Zähnen (22a, 22b) des ersten Kettenrads (20) befindet.

3. Teilmontage eines hinteren Kettenzahnrads gemäß einem der vorhergehenden Ansprüche, wobei eine Vertiefung (24) auf einer Seitenfläche des ersten Kettenrads (20), die dem zweiten Kettenrad (30) zugewendet ist, gebildet ist, um zumindest einen Teil der Kettenplatten eines Kettenteils, der von dem zweiten Kettenrad (30) zu dem ersten Kettenrad (20) verschoben wird, aufzunehmen.

4. Teilmontage eines hinteren Kettenzahnrads gemäß einem der vorhergehenden Ansprüche, wobei eine Vertiefung (34) auf einer Seitenfläche des zweiten Kettenrads (30), die dem ersten Kettenrad (20) abgewendet ist, gebildet ist, die ausgerichtet ist, um zumindest einen Teil der Kettenplatten eines Kettenteils, der von einem dritten Kettenrad zu dem zweiten Kettenrad (30) verschoben wird, aufzunehmen, wobei das dritte Kettenrad weniger Zähne als das zweite Kettenrad aufweist.

5. Teilmontage eines hinteren Kettenzahnrads gemäß einem der vorhergehenden Ansprüche weiterhin bestehend aus einem Befestigungsmittel (6), um das erste Kettenrad (20) und das zweite Kettenrad (30) jeweils an der ersten Befestigungsfläche (16) und der zweiten Befestigungsfläche (17) zu befestigen.

6. Teilmontage eines hinteren Kettenzahnrads gemäß Anspruch 5, wobei das Befestigungsmittel (6) aus einem Befestigungsstift besteht, der sich durch eine erste Kettenradöffnung (21) in dem ersten Kettenrad (20), eine zweite Kettenradöffnung (31) in dem zweiten Kettenrad (30) und eine Befestigungsöffnung (18) in einem entsprechenden Querträger (15) erstreckt.

7. Teilmontage eines hinteren Kettenzahnrads gemäß einem der vorhergehenden Ansprüche, wobei der Kettenradträger (10) aus einem Material gebildet wird, dessen spezifische Schwerkraft unter der des ersten Kettenrads (20) und der des zweiten Kettenrads (30) liegt.

8. Teilmontage eines hinteren Kettenzahnrads gemäß Anspruch 7, wobei der Kettenradträger (10) aus einer Aluminiumlegierung ist und wobei das erste Kettenrad (20) und das zweite Kettenrad (30) aus Stahl sind.

9. Teilmontage eines hinteren Kettenzahnrads gemäß einem der vorhergehenden Ansprüche, wobei der Vorsprung (11) konzentrisch zu einer Achse (X) ist und wobei der Vorsprung (11) aus folgendem besteht:

einem vorderen Teil, der sich von der Vielzahl von Querträgern (15) in die Richtung der Achse (X) erstreckt und in einer vorderen Endfläche (12) endet; und

einem hinteren Teil, der sich von der Vielzahl von Querträgern (15) in die Richtung der Achse (X) gegenüber dem vorderen Teil erstreckt und der in einer hinteren Endfläche (13) endet.

10. Eine Montage eines mehrstufigen Kettenzahnrads bestehend aus einer ersten Teilmontage eines hinteren Kettenzahnrads (1) gemäß einem der vorhergehenden Ansprüche.

11. Montage eines mehrstufigen hinteren Kettenzahnrads gemäß Anspruch 10, weiterhin bestehend aus einem dritten Kettenrad oder mehreren dritten Kettenrädern (3a, 3b, 3c), die in einer Reihe mit dem ersten Kettenrad (20) und dem zweiten Kettenrad (30) angeordnet sind.

12. Montage eines mehrstufigen hinteren Kettenzahnrads gemäß Anspruch 11, wobei bei dem dritten Kettenrad (3a, 3b,3c) jeweils ein zweites Eingriffsmittel (101b) auf einer inneren Umfangsfläche davon angebracht ist, um in den Einweg-Kupp-

lungsmechanismus (92) einzugreifen.

13. Montage eines mehrstufigen hinteren Kettenzahnrads gemäß Anspruch 11 oder 12, wobei jedes dritte Kettenrad (3a, 3b, 3c) die Form einer ringförmigen Platte aufweist.

14. Montage eines mehrstufigen hinteren Kettenzahnrads gemäß einem der Ansprüche 11 bis 13 weiterhin bestehend aus einem Abstandhalter (4), der zwischen den angrenzenden dritten Kettenrädern (3a, 3b, 3c) angebracht ist.

15. Montage eines mehrstufigen hinteren Kettenzahnrads gemäß einem der Ansprüche 11 bis 14 weiterhin bestehend aus einem Anschlußmittel, vorzugsweise in der Form einer Anschlußschraube, um das erste Kettenrad (20), das zweite Kettenrad (30) und zumindest ein drittes Kettenrad (3a, 3b, 3c) zu befestigen.

16. Montage eines mehrstufigen hinteren Kettenzahnrads gemäß Anspruch 12 oder einem davon abhängigen Anspruch, wobei zumindest das erste Eingriffsmittel (101a) oder das zweite Eingriffsmittel (101b) eine Vielzahl von Keilnuten beinhaltet.

17. Montage eines mehrstufigen hinteren Kettenzahnrads gemäß einem der Ansprüche 10 bis 16 weiterhin bestehend aus zumindest einer zusätzlichen Teilmontage eines hinteren Kettenzahnrads einschließlich einer zweiten Teilmontage eines hinteren Kettenzahnrads (2) gemäß einem der Ansprüche 1 bis 9.

18. Montage eines mehrstufigen hinteren Kettenzahnrads gemäß Anspruch 17, wobei die erste und die zweite Teilmontage eines hinteren Kettenzahnrads (1,2) in einer Reihe angeordnet sind.

19. Montage eines mehrstufigen hinteren Kettenzahnrads gemäß Anspruch 17 oder Anspruch 18, wobei die erste und die zweite Teilmontage des hinteren Kettenzahnrads (1,2) jeweils gemäß Anspruch 9 sind und wobei der hintere Teil des Vorsprungs (11) der ersten Teilmontage des hinteren Kettenzahnrads (1) mit dem vorderen Teil des Vorsprungs (11) der zweiten Teilmontage des hinteren Kettenzahnrads (2) ausgerichtet ist, um den Abstand zwischen dem zweiten Kettenrad (30) der ersten Teilmontage des hinteren Kettenzahnrads (1) und dem ersten Kettenrad (20) der zweiten Teilmontage des hinteren Kettenzahnrads (2) zu bestimmen.

20. Montage eines mehrstufigen hinteren Kettenzahnrads gemäß einem der Ansprüche 17 bis 19, wenn diese in Abhängigkeit von Anspruch 11 oder einem davon abhängigen Anspruch sind, weiterhin bestehend aus einem Anschlußmittel (5), um die erste Teilmontage des hinteren Kettenzahnrads (1), die zweite Teilmontage des hinteren Kettenzahnrads (2) und das jeweilige dritte Kettenrad (3a, 3b, 3c) miteinander zu befestigen.

21. Montage eines mehrstufigen hinteren Kettenzahnrads gemäß Anspruch 20, wobei das Anschlußmittel (5) eine Anschlußschraube beinhaltet, die durch die erste Teilmontage des hinteren Kettenzahnrads (1), die zweite Teilmontage des hinteren Kettenzahnrads (2) und das jeweilige dritte Kettenrad (3a, 3b, 3c) in die Richtung der Achse (X) durchgeht.

Revendications

1. Un sous-ensemble de pignons à chaîne de roue arrière pour une bicyclette comportant :

   un support de pignon à chaîne (10) comprenant :

   un bossage (11) comprenant, disposé sur sa surface périphérique interne, un premier moyen d'engrenage (101a) destiné à s'engrener dans un mécanisme d'embrayage unidirectionnel (92) ; et

   une pluralité de bras de soutien (15) se prolongeant de façon radiale vers l'extérieur à partir du bossage (11) ;

   dans lequel chaque bras de soutien (15) comprend une première surface de montage (16) et une seconde surface de montage (17) située à l'opposé de la première surface de montage (16) dans une zone extrême du bras de soutien (15) ;

   un premier pignon à chaîne (20) monté sur la première surface de montage (16) de chaque bras de soutien ; et

   un deuxième pignon à chaîne (30) monté sur la deuxième surface de montage (17) de chaque bras de soutien ; dans lequel :
   ledit premier pignon à chaîne comprend une première pluralité de dents et ledit deuxième pignon à chaîne comprend une deuxième pluralité de dents différentes en nombre de ladite première pluralité de dents, la différence entre le nombre de dents sur le premier pignon à chaîne (20) et le nombre de dents sur le deuxième pignon à chaîne (30) étant de l'ordre de une à trois dents.

2. Le sous-ensemble de pignons à chaîne de roue arrière selon la revendication 1 dans lequel le pre-

mier pignon à chaîne (20) et le deuxième pignon à chaîne (30) sont fixés respectivement à la première surface de montage (16) et à la deuxième surface de montage (17) de sorte qu'un galet de chaîne (71) commençant à s'engrener dans le premier pignon à chaîne (20) lorsqu'une chaîne (7) passe du deuxième pignon à chaîne (30) au premier pignon à chaîne (20) se trouve dans une zone centrale (23) entre des dents adjacentes (22a, 22b) du premier pignon à chaîne (20).

3. Le sous-ensemble de pignons à chaîne de roue arrière selon l'une ou l'autre des revendications précédentes dans lequel un renfoncement (24) est formé sur une surface latérale du premier pignon à chaîne (20) faisant face au deuxième pignon à chaîne (30) afin de recevoir au moins une partie des plateaux de chaîne d'une section de chaîne passant du deuxième pignon à chaîne (30) au premier pignon à chaîne (20).

4. Le sous-ensemble de pignons à chaîne de roue arrière selon une quelconque des revendications précédentes dans lequel un renfoncement (34) est formé sur une surface latérale du deuxième pignon à chaîne (30) tournant le dos au premier pignon à chaîne (20) prévu pour recevoir au moins une partie des plateaux de chaîne d'une section de chaîne passant d'un troisième pignon à chaîne au deuxième pignon à chaîne (30), dans lequel le troisième pignon à chaîne possède moins de dents que le deuxième pignon à chaîne.

5. Le sous-ensemble de pignons à chaîne de roue arrière selon une quelconque des revendications précédentes comprenant de plus des moyens de fixation (6) pour fixer le premier pignon à chaîne (20) et le deuxième pignon à chaîne (30) respectivement à la première surface de montage (16) et à la deuxième surface de montage (17).

6. Le sous-ensemble de pignons à chaîne de roue arrière selon la revendication 5 dans lequel le moyen de fixation (6) comprend une broche de fixation laquelle traverse dans son prolongement un premier trou de pignon à chaîne (21) dans le premier pignon à chaîne (20), un deuxième trou de pignon à chaîne (31) dans le deuxième pignon à chaîne (30), et un trou de fixation (18) dans un bras de soutien correspondant (15).

7. Le sous-ensemble de pignons à chaîne de roue arrière selon une quelconque des revendications précédentes dans lequel le support de pignon à chaîne (10) est réalisé à partir d'un matériau possédant un poids spécifique inférieur à celui du premier pignon à chaîne (20) et du deuxième pignon à chaîne (30).

8. Le sous-ensemble de pignons à chaîne de roue arrière selon la revendication 7 dans lequel le support de pignon à chaîne (10) est réalisé à partir d'un alliage d'aluminium, et dans lequel le premier pignon à chaîne (20) et le deuxième pignon à chaîne (30) sont réalisés à partir d'acier.

9. Le sous-ensemble de pignons à chaîne de roue arrière selon une quelconque des revendications précédentes dans lequel le bossage (11) est concentrique par rapport à un axe (X), et dans lequel le bossage (11) comprend :

   une partie avant qui s'écarte, dans son prolongement, de la pluralité de bras de soutien (15) dans le sens de l'axe (X) et se termine par une surface d'extremité avant (12) ; et

   une partie arrière oui s'écarte, dans son prolongement, de la pluralité de bras de soutien (15) dans le sens de l'axe (X) à l'opposé de la partie avant et se termine par une surface d'extrémité arrière (13).

10. Un ensemble de pignons à chaîne multiples de roue arrière comprenant un premier sous-ensemble de pignons à chaînes de roue arrière (1) selon une quelconque des revendications précédentes.

11. Un ensemble de pignons à chaîne multiples de roue arrière selon la revendication 10 comprenant de plus un ou plusieurs troisièmes pignons à chaînes (3a, 3b, 3c) alignés à la suite du premier pignon à chaîne (20) et du deuxième pignon à chaîne (30).

12. Un ensemble de pignons à chaîne multiples de roue arrière selon la revendication 11, chacun des troisièmes pignons à chaîne (3a, 3b, 3c) présentant un deuxième moyen d'engrenage (101b) disposé sur sa surface périphérique interne afin de s'engrener dans ledit mécanisme d'embrayage unidirectionnel (92).

13. L'ensemble de pignons à chaîne multiples de roue arrière selon les revendications 11 ou 12 dans lequel chacun des troisièmes pignons à chaîne (3a, 3b, 3c) est en forme de plateau annulaire.

14. L'ensemble de pignons à chaîne multiples de roue arrière selon une quelconque des revendications 11 à 13 comprenant de plus un élément intercalaire (4) disposé entre les troisièmes pignons à chaîne adjacents (3a, 3b, 3c).

15. L'ensemble de pignons à chaîne multiples de roue arrière selon une quelconque des revendications 11 à 14 comprenant de plus un moyen de raccordement, de préférence sous forme d'une vis de rac-

cordement, afin de fixer le premier pignon à chaîne (20), le deuxième pignon à chaîne (30) et au moins un des troisièmes pignons à chaîne (3a, 3b, 3c).

16. L'ensemble de pignons à chaîne multiples de roue arrière selon la revendications 12 ou n'importe quelle revendication qui en dépend dans lequel au moins un parmi le premier moyen d'engrenage (101a) et le deuxième moyen d'engrenage (101b) comprend une pluralité de cannelures.

17. Un ensemble de pignons à chaîne multiples de roue arrière selon une quelconque des revendications 10 à 16 comprenant de plus au moins un sous-ensemble de pignons à chaîne de roue arrière supplémentaire comprenant un deuxième sous-ensemble de pignons à chaîne de roue arrière (2) selon une quelconque des revendications 1 à 9.

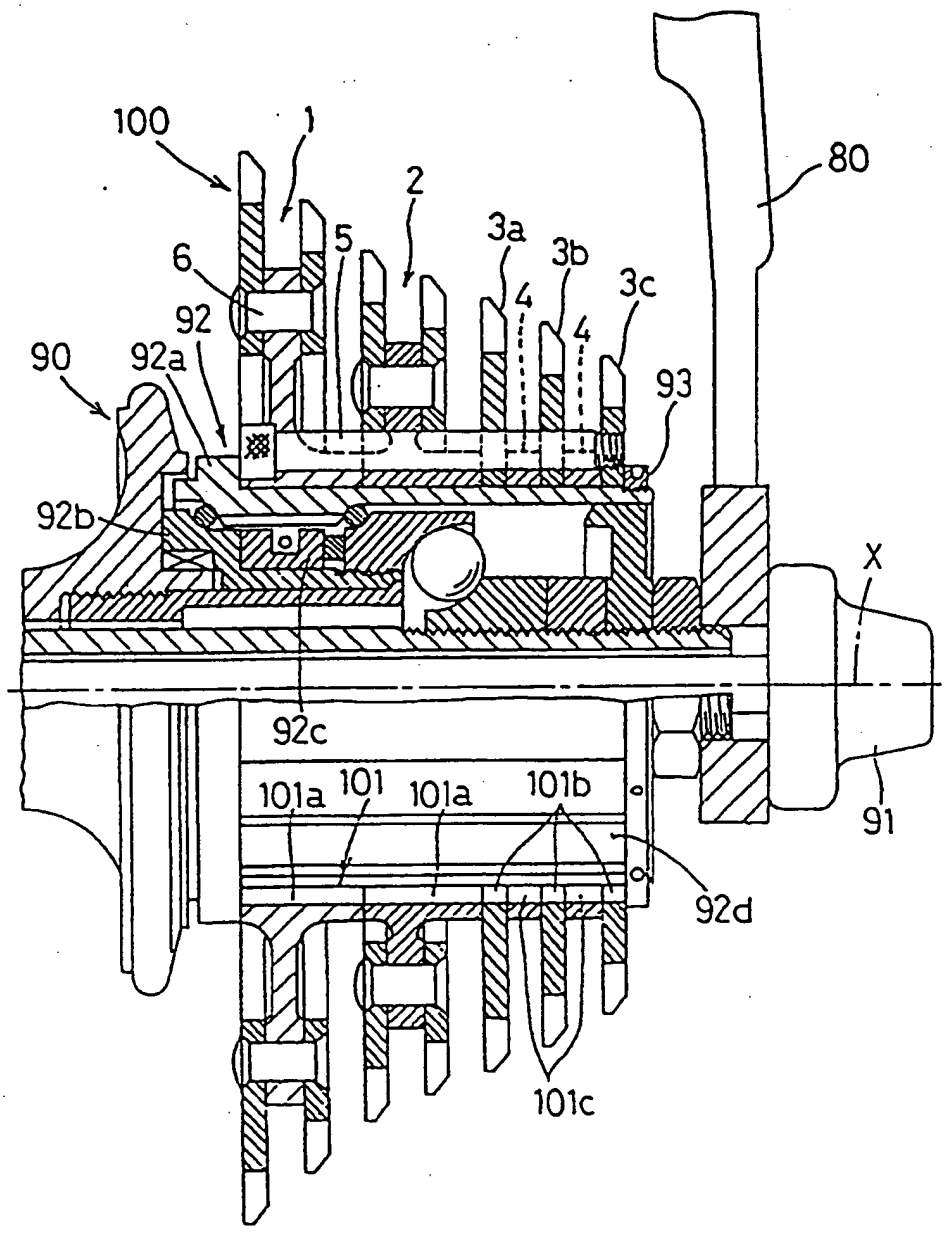
18. Un ensemble de pignons à chaîne multiples de roue arrière selon la revendication 17 dans lequel les premier et deuxième sous-ensembles de pignons à chaîne de roue arrière (1, 2) sont alignés à la suite.

19. L'ensemble de pignons à chaîne multiples de roue arrière selon les revendications 17 ou 18 dans lequel les premier et deuxième sous-ensembles de pignons à chaîne de roue arrière (1, 2) sont tous deux en accord avec la revendication 9 et dans lequel la partie arrière du bossage (11) du premier sous-ensemble de pignons à chaîne de roue arrière (1) est alignée sur la partie avant du bossage (11) du deuxième sous-ensemble de pignons à chaîne de roue arrière (2) afin de définir l'espace entre le deuxième pignon à chaîne (30) du premier sous-ensemble de pignons à chaîne de roue arrière (1) et le premier pignon à chaîne (20) du deuxième sous-ensemble de pignons à chaîne de roue arrière (2).

20. L'ensemble de pignons à chaîne multiples de roue arrière selon une quelconque des revendications 17 à 19, lorsqu'elles dépendent de la revendication 11 ou de n'importe quelle revendication qui en dépend, comprenant de plus des moyens de raccordement (5) pour fixer le premier sous-ensemble de pignons à chaîne de roue arrière (1), le deuxième sous-ensemble de pignons à chaîne de roue arrière (2) et chacun des troisièmes pignons à chaîne (3a, 3b, 3c) les uns aux autres.

21. L'ensemble de pignons à chaîne multiples de roue arrière selon la revendication 20 dans lequel le moyen de raccordement (5) comprend une vis de raccordement laquelle traverse le premier sous-ensemble de pignons à chaîne de roue arrière (1), le deuxième sous-ensemble de pignons à chaîne de roue arrière (2) et chacun des troisièmes pignons à chaîne (3a, 3b, 3c) dans le sens de l'axe (X).

Figure 1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2
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5
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3b
3c
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101c

Figure 2

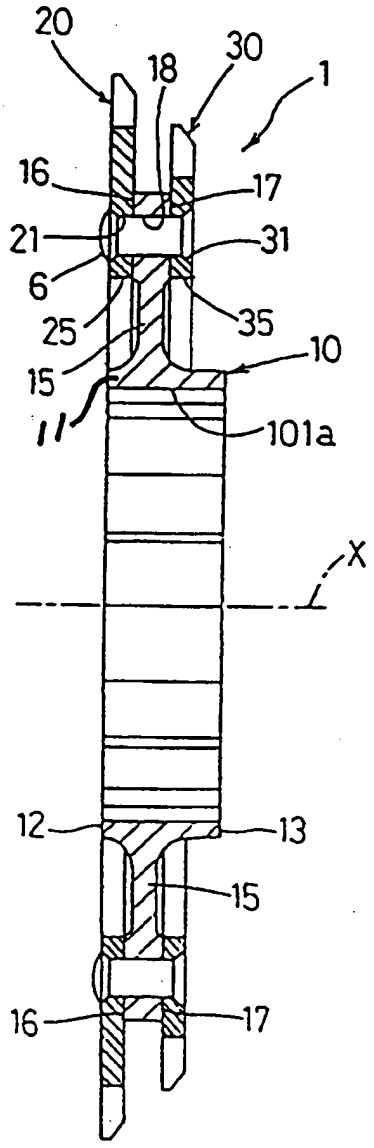

Figure 3

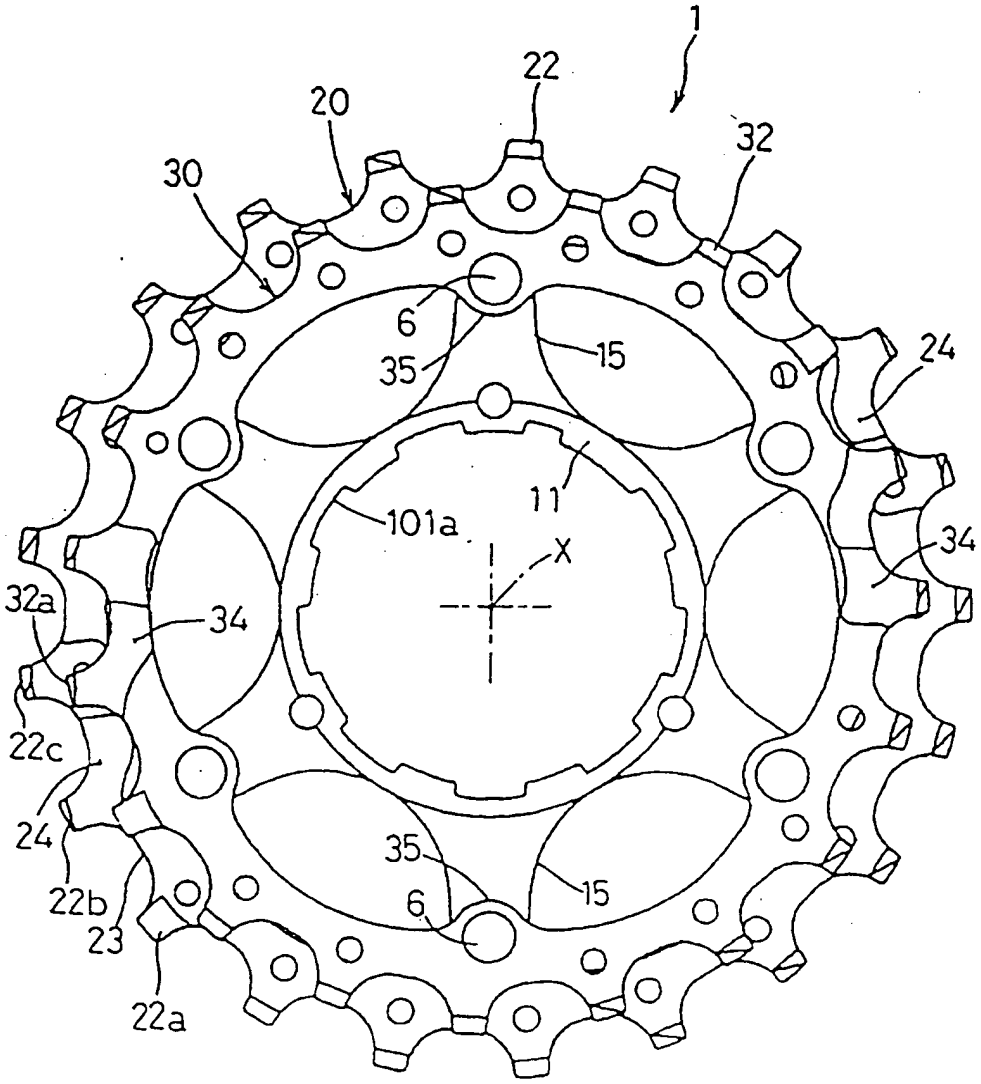

Figure 4

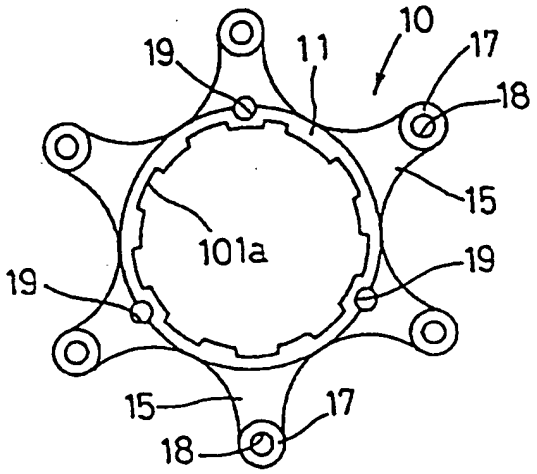

Figure 5

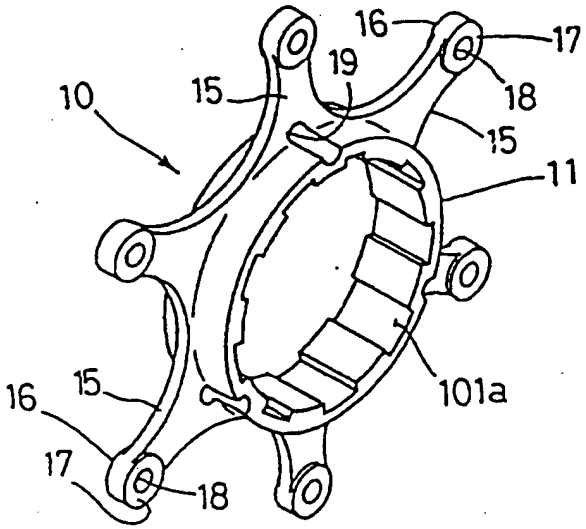

Figure 6

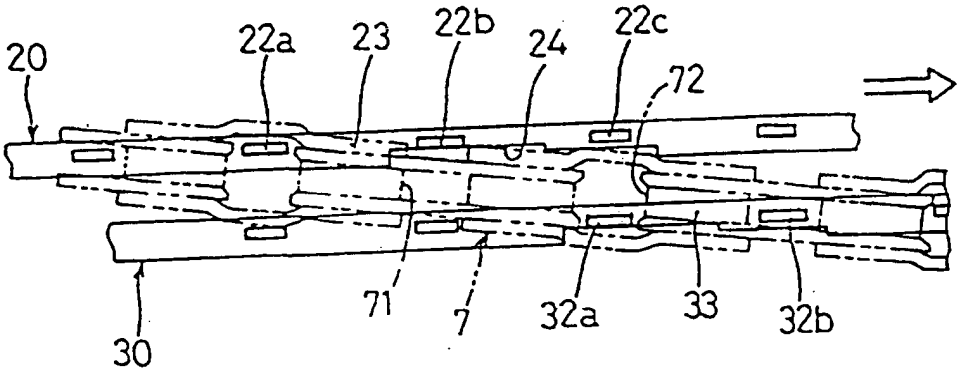

Figure 7

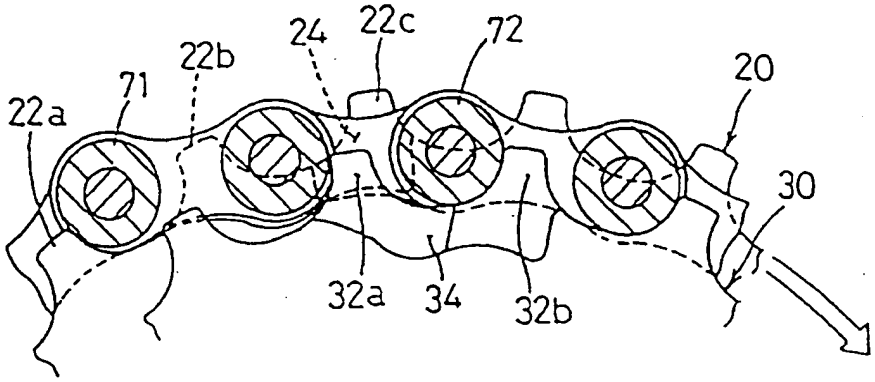

Figure 8

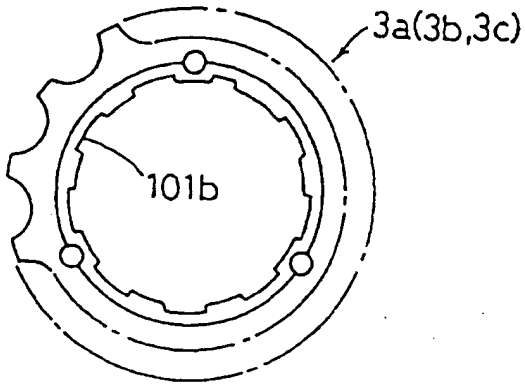

Figure 9